

**Remarks**

The above Amendments and these Remarks are in reply to the Office Action mailed 21 September 2004. No fee is due for the addition of any new claims. An appropriate Petition for Extension of Time to Respond is submitted herewith, together with the appropriate fee.

Claims 1-20 were pending in the Application prior to the outstanding Office Action. In the Office Action, the Examiner allowed claims 19 and 20, rejected claims 1, 2, 5-8, 10, 11 and 13-18, and objected to claims 3, 4, 9 and 12 solely as being dependent upon a rejected base claim. The present Response amends claims 1, 2, 13 and 14, leaving for the Examiner's present consideration claims 3-12 and 15-20. Reconsideration of the rejections is requested.

**I. DRAWINGS**

The Examiner objected to the Drawings because Fig. 4 includes an incorrect reference number. According to the Examiner, the die referred to in the drawing with reference number 1 should be 100. Corrected drawing sheets were required.

Instead of correcting the drawing sheets, Applicants have instead amended the Specification to refer to reference number 1 instead of 100. This occurs at two places in the specification: page 9 at lines 3 and 7.

Accordingly, it is believed that the objection to the drawings has been overcome.

## II. FORMALITY OBJECTIONS

### A. Specification

The Examiner objected to the disclosure because throughout the specification, ":m" should be " $\mu$ m".

This correction has been made.

In addition, throughout the specification, "@C" has been changed to "°C".

### B. Claims

The Examiner objected to claim 1 on the ground that "the complement" lacks antecedent basis.

Claim 1 has now been amended to replace the term "*the* complement" with the phrase, "*a* complement". As amended, the claim no longer implies a reference to an antecedent use of the term "complement". Accordingly, it is submitted that this objection has been overcome.

The same amendment has been made to claim 2. It is not believed that these amendments change the scope of either claim.

The Examiner objected to claim 2 on the ground that "form" should be "from". This typographical error has been corrected. Again, it is not believed that this amendment changes the scope of the claim.

The Examiner objected to claims 13-14 on the ground that the phrase "the waveguide width" should be "the width of the waveguide core." This change has been made. Again, it is not believed that this amendment changes the scope of the claim.

Accordingly, it is respectfully submitted that all of the formality objections have been overcome.

### III. ART REJECTIONS

#### A. Rejections over Soref Alone

The Examiner rejected claims 1, 2, 5-7 and 15-18 as being obvious over Soref. Applicants will discuss the independent claims first, followed by the dependent claims in this group.

##### 1. Independent Claim 1

Soref teaches an optical strip waveguide in which a silicon top layer 1 is etched down and slightly into a dielectric insulator layer 3, to form a rectangular waveguide strip 1 (see Soref's Fig. 2(a)). The entire uppermost "mesa" portion of the resulting stairstep 3' contacts the lower silicon strip portion. (Soref, col. 3, lines 29-34).

Applicants' claim 1 calls for a method of fabricating an integrated optical device on a substrate, in which, among other things:

the height of the mesa formation is selected so as to give a substantially zero birefringence in the waveguide core.

The Examiner points to Soref's disclosure at col. 5, lines 29-31, as teaching that his "first cladding layer structure, which includes the mesa formation, makes possible high Q optical resonators in the waveguide." The Examiner then argues that "[i]t is well known that Q-value is inversely proportional to birefringence." Both steps in the Examiner's position are problematical.

First, the Examiner says that Soref's disclosure at col. 5, lines 29-31, teaches that his "first cladding layer structure, which includes the mesa formation, makes possible high Q optical resonators in the waveguide."

The Examiner may be correct that Soref's first cladding layer structure helps to make high Q optical resonators possible, but the cited language of Soref does *not* say that his *mesa formation* is the reason.

Soref's actual language is: "A key aspect of the insulating lower cladding layer (SOI construction) is that it makes possible high-Q optical resonators in the strip guide as shown in FIG. 4, because of the large index step and the consequent optical isolation."

In other words, Soref is saying that high-Q optical resonators are made possible because the *refractive index* of the lower cladding layer (the "insulator" part of SOI, Silicon-On-Insulator) is much less than the refractive index of the core layer (which is Silicon), and that creates a large step-down in the index of refraction at the boundary of core and cladding. **It is this large step in index of refraction (not the physical step of the mesa structure) which the cited language of Soref teaches as making the high-Q optical resonators possible.**

Therefore the Examiner is incorrect in implying a teaching in the cited language of Soref that it is his *mesa formation* which "makes possible high Q optical resonators in the waveguide."

Second, even apart from the above mis-citation, the Examiner's position that "[i]t is well known that Q-value is inversely proportional to birefringence," is completely unsupported. Bi-

refrindex may be one of many factors that can reduce the Q value of a structure, but there is **no** such "well known" principle "that Q-value is inversely proportional to birefringence."

According to MPEP 2144.03, the Examiner can make a rejection on the basis of "well known" matters or "matters of common knowledge," but only under certain conditions described in MPEP 2144.03A. At a minimum, the facts asserted to be well known must be "capable of instant and unquestionable demonstration as being well-known." MPEP 2144.03A, paragraph 2. The MPEP continues, "For example, assertions of technical facts in the areas of esoteric technology or specific knowledge of the prior art must always be supported by citation to some reference work recognized as standard in the pertinent art."

MPEP 2144.03C authorizes Applicants to challenge factual assertions as not properly based upon common knowledge. Applicants hereby do so, and point out that there is no well known principle "that Q-value is inversely proportional to birefringence."

Therefore, if the Examiner persists in this rejection, pursuant to 2144.03C, **Applicants respectfully request that the Examiner cite a reference in support of her position** that such a principle exists and is well known.

Moreover, even if the Examiner were correct that Soref teaches that the mesa formation "makes possible high Q optical resonators in the waveguide," and that Q-value is inversely proportional to birefringence," that *still* would not teach the limitation of Applicants' claim.

Applicants' claim 1 calls for the height of the mesa formation to be "selected so as to give a *substantially zero* birefringence in the waveguide core." As pointed out throughout Applicants'

specification, there is an optimum mesa height (over-etch depth) which gives zero birefringence, and greater heights cause the birefringence to once again start *increasing* in magnitude. See, for example, Applicants' Fig. 2 and p.8, lines 3-4 of Applicants' specification. The Examiner has not cited anything in Soref that teaches or suggests that the mesa height be selected to give *substantially zero* birefringence.

In fact, Soref appears to make *no mention at all* about how deep his over-etch is to be, except to say that the silicon top layer be etched through and "slightly" down into the insulator layer. (Soref, col. 3, line 31.) "Slightly" is hardly a teaching that the over-etch depth be "selected so as to give a *substantially zero* birefringence", and not beyond that depth.

In light of the above, it is respectfully submitted that the Examiner has failed to make a prima facie case that claim 1 is unpatentable.

2. Independent Claim 2

Applicants' claim 2 calls for a method of fabricating an integrated optical device on a substrate, in which, among other things:

the height of the mesa formation is selected to give a desired reduced level of birefringence in the waveguide core.

As with claim 1, the Examiner's rejection of claim 2 is based on a mis-reading of Soref's disclosure at col. 5, lines 29-31, and an improper official notice that "[i]t is well known that Q-value is inversely proportional to birefringence."

**Applicants again respectfully submit that there is no such "well known" principle "that Q-value is inversely proportional to birefringence."**

Pursuant to 2144.03C, therefore, if the Examiner persists in this rejection, then  
**Applicants respectfully request that the Examiner cite a reference in support of her position**  
that such a principle exists and is well known.

The Examiner has also failed to show any teaching in Soref that the height of the mesa formation is selected to give "a desired reduced level of birefringence" in the waveguide core, as called for in Applicants' claim. "Slightly" does not teach anything about how much birefringence reduction will occur for a given over-etch depth.

As with claim 1, therefore, it is respectfully submitted that the Examiner has failed to make a prima facie case that claim 2 is unpatentable.

3. Independent Claim 16

Applicants' claim 3 calls for an integrated optical device in which, among other things:

the height of the mesa formation is such that there is substantially zero birefringence in the waveguide core.

As with claims 1 and 2, the Examiner's rejection of claim 16 is based on a mis-reading of Soref's disclosure at col. 5, lines 29-31, and an improper official notice that "[i]t is well known that Q-value is inversely proportional to birefringence."

**Applicants again respectfully submit that there is no such "well known" principle "that Q-value is inversely proportional to birefringence."**

Pursuant to 2144.03C, therefore, if the Examiner persists in this rejection, then

**Applicants respectfully request that the Examiner cite a reference in support of her position that such a principle exists and is well known.**

The Examiner has also failed to show any teaching in Soref that the height of the mesa formation is such that there is "substantially zero birefringence" in the waveguide core, as called for in Applicants' claim.

As with claims 1 and 2, therefore, it is respectfully submitted that the Examiner has failed to make a prima facie case that claim 16 is unpatentable.

4. Dependent Claims 5-7, 15, 17 and 18

Claims 5-7, 15, 17 and 18 all depend ultimately from one of the independent claims 1, 2 or 16 and therefore are believed to be patentable for at least the reasons set forth above with respect to such independent claims. In addition, these claims each add their own limitations which, it is submitted, render them patentable in their own right.

Applicants have reviewed the grounds for rejection of these claims as stated by the Examiner and respectfully do not agree with the positions taken. Nevertheless Applicants do not believe it necessary to discuss their views on these claims further, since as set forth above, Applicants do not believe that the Examiner has made a prima facie case that the independent claims are unpatentable. Applicants respectfully reserve the right to present their further points regarding these claims should it become necessary in the future.

Accordingly, claims 5-7, 15, 17 and 18 are believed to be patentable.



**B. Rejections over Soref in Combination with Other References**

The Examiner rejected claims 8, 10, 11, 13 and 14 over various combinations of Soref, Bosso, Kawachi and Kilian.

These claims all depend ultimately from one of the independent claims 1 or 2 and therefore are believed to be patentable for at least the reasons set forth above with respect to such independent claims. In addition, these claims each add their own limitations which, it is submitted, render them patentable in their own right.

As with the other dependent claims, Applicants have reviewed the grounds for rejection of these claims as stated by the Examiner and respectfully do not agree with the positions taken. Nevertheless Applicants do not believe it necessary to discuss their views on these claims further, since as set forth above, Applicants do not believe that the Examiner has made a prima facie case that the independent claims are unpatentable. Applicants respectfully reserve the right to present their further points regarding these claims should it become necessary in the future.

Accordingly, claims 8, 10, 11, 13 and 14 are believed to be patentable.

**IV. OTHER MATTERS AND CONCLUSION**

Claims 19 and 20 have been allowed.

The reference cited by the Examiner but not relied upon has been reviewed, but is not believed to render the claims unpatentable, either singly or in combination.

In light of the above, it is respectfully submitted that all of the claims now pending in the subject patent application should be allowable, and a Notice of Allowance is requested. The

Examiner is respectfully requested to telephone the undersigned if he can assist in any way in expediting issuance of a patent.

Enclosed is a PETITION FOR EXTENSION OF TIME UNDER 37 C.F.R. 1.136 for extending the time to respond up to and including 21 March 2005.

The Commissioner is authorized to charge any underpayment or credit any overpayment to Deposit Account No. 50-0869 for any matter in connection with this response, including any fee for extension of time, which may be required.

Respectfully submitted,

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